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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

| Office Action Summary | Application No. | Applicant(s) |
|---|---|---|
| | 09/765,995 | ALUMOT ET AL. |
| | Examiner | Art Unit |
| | Martin Miller | 2623 |

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on 25 June 2001.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☐ Claim(s) 1-95 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) 1-95 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5&6 .

4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other:

## DETAILED ACTION

### *Information Disclosure Statement*

1. The examiner has considered the IDS filed with the application, the IDSs filed January 14, 2002, and February 21, 2002, and an initialed copy of each is enclosed with this office action.

### *Preliminary Amendment*

2. The preliminary amendment filed June 25, 2001 has been entered into the file.

### *Specification*

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The title should mention the novel feature(s) of the claimed invention.

4. This application does not contain an abstract of the disclosure as required by 37 CFR 1.72(b). An abstract on a separate sheet is required.

### *Claim Objections*

5. Claims 29 and 92 are objected to because of the following informalities: claim 14 has an inadvertent period after the word "depths"; claim 24, limitation (a) the word "neighbors" is misspelled as --noighbers--; claim 29 recites a "laser bean" which should read "laser beam"; claim 92 has misspelled the word "images" on both occasions in which the word is used.

### *Double Patenting*

6. A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ... may obtain a patent therefor ..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v.*

*Eagle Mfg. Co.*, 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969). A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. 37 CFR 1.130 (b). Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73 (b).

7. Claims 1, 2, 6-9, 12-16 41-54, 90 and 91 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent No. 5,699,447 in view of Ohtombe et al., US 4,764,969.

Ohtombe et al. teaches a method and an apparatus for inspecting the surface of articles for defects by placing the article on a table (article 1 on table 8 in Figure 1), the article surface is examined at a low resolution (4 in Figure 1) and data representing possible defects is output

column 3, lines 52-55) and stored (column 3, lines 62-64). The surface of the article is then examined at a high resolution to determine actual defects (10, 11 in Figure 1). Ohtombe et al. also teaches that the entire article is examined at the low resolution and only the locations of the possible defects are examined at the higher resolution (column 4, line 67 through column 5, line 9) and that the article is a semiconductor with a repetitive pattern (Figure 2).

8. Claims 17-19, 29-32, 55, 56 78, and 79 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent No. 5,699,447 in view of Specht et al., US 4,805,123.

Specht et al. teaches a method and an apparatus for inspecting the surface of an article for defects by generating a first flow of data representing the pixels of the image of the article being inspected, generating a second flow of data representing the pixels of a reference image and comparing the two flows to locate defects in the article (column 3, lines 47-55 and 61-66). Specht et al. also teaches detecting any misalignment between the two data flows and correcting for this misalignment by shifting the flows with respect to each other (column 11, lines 1-8). Finally, Specht et al. also teaches use of a table to place the article on (column 4, lines 60-61) and that the article is a semiconductor with a repetitive pattern thereon (column 2, line 62-66).

9. Claims 33-40, 80-87, 89 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent No. 5,699,447 in view of Maeda et al.,

Maeda et al. teaches a method of inspecting the surface of an article for defects by imaging an article and a reference for each location at a plurality of depths (column 4, lines 31-40), detecting and removing any misalignment between the images (column 4, line 59 through

column 5, line 16) and comparing the article and the reference to detect the defects (column 5, lines 17-44). Maeda et al. teaches that the article is a semiconductor (column 1, lines 7-10). US 4,791,586.

*Claim Rejections - 35 USC § 112*

10. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

11. Claims 1-32, 36, 43, 47-48, 55-88, and 90-95 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims contain a number of terms and recitations that lack proper antecedent basis. These include: "said first examining phase" at lines 1-2 of claim 2, line 2 of claim 3, lines 1-2 of claim 8 and lines 1-2 of claim 10; "said second examining phase" at line 3 of claim 2, lines 1-2 of claim 4 and lines 1-2 of claim 11; "said imagining operation" at lines 1-2 of claim 12; "said comparing operation" at lines 1-2 of claim 15, lines 1-2 of claim 18, lines 1-2 of claim 21 and lines 1-2 of claim 36; "said comparison of the suspected locations" at line 8 of claim 17; "said comparison" at line 1 of claim 22, line 7 of claim 47 and line 9 of claim 55; "said comparable pattern units" at lines 1-2 of claim 27; "said grid" at line 1 of claim 28; "said generating operations" at lines 1-2 of claim 29; "said converter" at line 1 of claim 43; claim 92, the entire claim is nonsensical, and "said end streams of data" at line 3 of claim 95. In addition, the term "inspected" appears to be misspelled in line 5 of claim 55. Also, the recitation of "the images" in line 9 of claim 80 is indefinite because it is unclear what images are being referred to, as none

have been recited in the claim prior to this. The claims not specifically addressed above are rejected as they variously depend from indefinite base claims.

*Claim Rejections - 35 USC § 102*

12. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

13. Claims 1-7, 41, 42, 44, 45, 46, 49, 88 and 89 are rejected under 35 U.S.C. § 102(b) as being anticipated by Ohtombe et al. (hereinafter Ohtombe), US 4,764,969.

As per claim 1, Ohtombe teaches:

placingthe article to be inspected on a table(article 1 on table 8 in Figure 1);

in a first phase, optically examining the complete surface of the article on the table inspected at a relatively high speed and with a relatively low spatial resolution(4 in Figure 1);

electrically outputting information indicating suspected locations on the article having a high probability of a defect (column 3, lines 52-55);

storing said outputted information in a storage device (column 3, lines 62-64);

and in a second phase, while the article is still on said table, optically examining with a relatively high spatial resolution (10, 11 in Figure 1) only said suspected locations stored in said storage device for the presence or absence of a defect in said suspected locations (column 4, line 67 through column 5, line 9).

As per claim 2, Ohtombe teaches:

wherein said first examining phase (macroscopic) is effected by optically scanning the complete article surface to be inspected (col. 4, ll. 67-68); and said second examining phase is automatically effected immediately after the first phase by imaging only said suspected locations (col. 5, ll. 10-12) on a converter which converts the images to electrical signals and then analyzes said electrical signals (col. 5, ll. 20-25).

As per claim 3, Ohtombe teaches:

wherein said surface of the article includes a pattern to be inspected (col. 2, ll. 54-55); and said first examining phase is effected by making a comparison between the inspected pattern and another pattern serving as a reference pattern (col. 3, ll. 47-52), and identifying locations (coordinate values) on the inspected pattern wherein the comparison shows sufficient differences with respect to the reference pattern to indicate a high probability of a defect in the inspected pattern(col. 3, ll. 51-55).

As per claim 4, Ohtombe teaches:

wherein said second examining phase is also effected by making a comparison between the inspected pattern and the reference pattern, and identifying locations on the inspected pattern wherein the comparison shows sufficient differences with respect to the reference pattern to indicate the presence of a defect at the suspected location of the reference pattern (see figure 1, second image processor, 12, performs same procedure as first image processor, 5, col. 3, ll. 28-30).

As per claim 5, Ohtombe teaches:

wherein said article to be inspected has a plurality of repetitive pattern units, one of which units serves as the inspected pattern (col. 2, ll. 54-55) and is compared with at least one other unit of said article serving as the reference pattern (col. 3, ll. 47-52).

As per claim 6, Ohtombe teaches:

wherein the article to be inspected is a semiconductor wafer having a plurality of like integrated-circuit dies each formed with like patterns, the pattern of one of which dies serves as the inspected pattern and is compared with the like pattern of at least one other die serving as the reference pattern. (col. 3, ll. 46-55, Figure 2 shows the like patterns from the sectioned portions of the image are used as reference data).

As per claim 7, Ohtombe teaches:

wherein the article to be inspected is a semiconductor wafer having a plurality of like integrated-circuit dies, each die being formed with a plurality of like patterns, one of which patterns of one die serves as the inspected pattern and is compared with another like pattern of the same die serving as the reference pattern. (col. 3, ll. 46-55, Figure 2 shows the like patterns from the sectioned portions of the image are used as reference data).

As per claim 88, Ohtombe teaches:

wherein said repetitive pattern units are spaced from each other a predetermined distance such as to define repetitive pattern zones, (figure 2), and the suspected locations outputted from said first phase are restricted to locations in said repetitive pattern zones (col 3, ll. 44-46).

As per claim 89, Ohtombe teaches:

wherein said like patterns in all said dies are spaced from each other a predetermined distance such as to define repetitive pattern zones (figure 2); and said first examining means includes

means for suppressing from the suspected locations (masked or non-masked col. 2, l. 55) outputted from said first phase those locations not in said repetitive pattern zones.

As per claims 41, 42, 44, 45, 46, and 49, these claims recite substantially the same limitations as the claims rejected above and analogous remarks apply.

14. Claims 17-23, 25, 55-61, 63, and 92-94 are rejected under 35 U.S.C. § 102 (b) as being anticipated by Specht et al. (hereinafter Specht ), US 4805123.

As per claim 17, Specht teaches:

generating a first flow of N streams of data representing the pixels of different images of the inspected article (column 3, lines 50-52); generating a second flow of N streams of data representing the pixels of corresponding images of a reference(column 3, lines 52-54); and comparing the data of said first flow with the data of the second flow to provide an indication by said comparison of the suspected locations of the inspected article having a high probability of a defect(column 3, lines 61-66).

As per claim 18, Specht teaches:

correcting any misalignment between the two flows of data (col. 3, ll. 58-60);

comparing the data of each stream of the first flow with the data of the corresponding stream of the second flow to provide an alarm value indicating the significance of the presence of a suspected location in the stream (col. 3, l. 61);

and detecting a defect at a pixel location according to N alarm values corresponding to the N streams of data.

As per claim 19, Specht teaches:

wherein said correcting any misalignment is effected by:

selecting corresponding registration points in the streams of each flow (col. 3, l. 55, "storing corresponding points");

detecting misalignment between the registration points of the two flows(col. 3, ll. 56-60);

and shifting one flow with respect to the other flow to correct for said misalignment between the two flows(column 11, lines 1-8).

As per claim 20, Specht teaches:

wherein said detecting misalignment is effected by computing similarities between corresponding streams of data by summing correlation measures in all possible alignments. (col. 6, ll. 41-44, and 53-62).

As per claim 21, Specht teaches:

wherein said comparing operation includes:

assigning a type to each pixel in each of the N streams of each flow (left-side pixel versus right-side pixel, col. 5, ll. 30-35);

comparing each pixel in each stream of one flow with the corresponding pixel in the corresponding stream of the other flow with respect to predetermined thresholds which depend on the type assigned to the respective pixel (col. 11, ll. 1-9);

and assigning an alarm value (threshold, col. 7, ll. 30-33) to the pair of pixels in each comparison in each stream indicating the probability of a defect in the location of the inspected pattern unit corresponding to the respective pixels (alignment errors are compared to a sum of squared differences value, col. 11, ll. 41-65, and col. 12, ll. 10-15).

As per claim 22, Specht teaches:

wherein said comparison is further effected by detecting a defect at a pixel location according to the combination of the N alarm values corresponding to the N streams of data (col. 11, ll. 5-10).

As per claim 23, Specht teaches:

wherein each pixel is assigned one of a plurality of types according to predetermined parameters (whether detected by the left sensor or the right sensor, col. 5, ll. 33-35) with respect to the pixel and its pixel neighbours.

As per claim 25, Specht teaches:

wherein each pixel is assigned any one of a plurality of types including the following:

(a) isolated peak, if the pixel is a local maxima with significant intensity and ratio;

(b) multipeak, if the pixel is not an isolated peak and has significant intensity, and none of its neighbours is an isolated peak;

(c) slope (col. 15, ll. 34-36), if either one of the pixel's neighbours is an isolated peak or has significant gradient; and

(d) background, if the pixel has no significant intensity or gradient, and none of its neighbours is an isolated peak.

As per claim 92, Specht teaches:

wherein the second flow of N streams of data representing the pixels of corresponding images of a reference are generated from real images of another like article (col. 2, ll. 62-66, col. 4, ll. 65-68, "each die").

As per claim 93, Specht teaches:

wherein the second flow of N streams of data representing the pixels of corresponding images of a reference are generated from real images of another like pattern on the same article (col. 2, ll. 62-66, col. 4, ll. 65-68, "each die").

As per claim 94, Specht teaches:

wherein the second flow of N streams of data representing the pixels of corresponding images of a reference are generated from simulated images derived from a database. (col. 2, ll. 62-66, col. 5, ll. 21-23).

As per claims 55-61 and 63, these claims recite substantially the same limitations as those rejected above either identically or in various combinations and analogous remarks apply.

15. Claims 33, 36-40, 80-82 and 84-87 are rejected under 35 U.S.C. S 102(b) as being anticipated by Maeda et al. (hereinafter Maeda), US 4791586.

As per claim 33, Maeda teaches:

imaging, on a converter, each location of the article to be inspected and the corresponding location of a reference article at a plurality of different depths, to output two sets of electric signals for each depth corresponding to the pixels of the inspected article and reference article at that depth (col. 4, ll. 31-40);

shifting the electric signals of one set with respect to the electric signals of the other set to match the respective depths of the images (col. 6, l. 67-col. 7, l. 5); and

comparing the pixels of the inspected article with the corresponding pixels of the reference article to indicate a defect where a mismatch of a predetermined magnitude is found to exist at the respective location of the inspected article (col. 12, ll. 15-24, 29-34).

As per claim 36, Maeda teaches:

wherein said comparing operation is effected by comparing each pixel and its surrounding pixels (pattern, fig. 6A-6D, col. 3, ll. 11-15) of the inspected article with the corresponding pixel and its surrounding pixels of the reference article according to predetermined thresholds to indicate the location of any detected defects.

As per claim 37, Maeda teaches:

wherein said converter is an optic charge coupled device (figure 2, elements 5a and 5b).

As per claim 38, Maeda teaches:

wherein said article to be inspected has a plurality of comparable pattern units, one of which units serves as the inspected pattern and is compared with at least one other unit of said article serving as the reference pattern. (Abstract)

As per claim 39, Maeda teaches:

wherein the article to be inspected is a semiconductor wafer having a plurality of like integrated-circuit dies each formed with like patterns, the pattern of one die serving as the inspected pattern and is compared with the like pattern of at least one other die serving as the reference pattern. (Abstract)

As per claim 40, Maeda teaches:

wherein the article to be inspected is a semiconductor wafer having a plurality of like integrated-circuit dies, each die being formed with a plurality of like patterns, one of which patterns of one die serves as the inspected pattern and is compared with another like pattern of the same die serving as the reference pattern.(Abstract)

As per claims 80-82 and 84-87, they recite substantially the same limitations as claims 33, 36-40 above and analogous remarks apply.

*Claim Rejections - 35 USC § 103*

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

17. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

18. Claims 8-16, 29, 47-49, 78 and 79 are rejected under 35 U.S.C. § 103 as being unpatentable over Ohtombe et al. as applied to claims 1-7, 41-46 and 88-91 above, and further in view of Specht et al.

As per claim 8, Ohtombe does not teach two data streams. However, claim 8 recites substantially the same limitations as in claim 17 as taught by Specht above and analogous remarks apply. Because these features represent a specific method of comparing the article with a reference to locate the deflects and because Ohtombe provides only a general teaching of making the comparison, it would have been obvious to one of ordinary skill that the Ohtombe comparison could have been performed using the data flows taught by Specht et al.

As per claim 9, Ohtombe does not teach two data streams. However, claim 9 recites substantially the same limitations as in claim 18 as taught by Specht above and analogous remarks apply. These features represent a specific method of comparing the article with a reference to locate the deflects and because Ohtombe provides only a general teaching of making the comparison, it would have been obvious to one of ordinary skill that the Ohtombe comparison could have been performed using the data flows taught by Specht et al.

As per claim 11, Ohtombe does not teach two sets of electrical signals. However, Specht does teach two data streams which each consist of electrical signals.

Specht teaches:

imaging on a converter each suspected location of the inspected pattern unit and the corresponding location of the reference pattern unit is output two sets of electric signals (col. 3, ll. 50-54) corresponding to the pixels of the inspected pattern unit and the reference pattern unit, respectively;

and comparing the pixels of the inspected pattern unit with the corresponding pixels of the reference pattern unit to indicate a defect whenever a mismatch of a predetermined magnitude is found to exist at the respective location. (col. 3, l. 61).

As per claim 15, Ohtombe teaches:

wherein said comparing operation is effected by comparing each pixel and its surrounding pixels of the inspected pattern unit with the corresponding pixel and its surrounding pixels of the reference pattern unit according to predetermined thresholds to indicate the location of any detected defects (col. 3, ll. 48-52).

As per claim 16, although Ohtombe using a camera, Ohtombe does not specifically teach that his cameras are optic charge coupled devices. Ohtombe's cameras are industrial television cameras (col. 2, ll. 56-58 and col. 5, l. 10), which to one of ordinary skill would be analogous to a charged-coupled device camera.

As per claim 29, Ohtombe teaches:

wherein said first examining phase is effected by a light source which is deflected to scan a line along one orthogonal axis, while the article to be inspected is physically displaced along a second orthogonal axis.(Figure 1, elements 3 and 14, col. 2, ll. 52-54). However, Ohtombe does not specifically teach that the light is a laser beam. It would have been obvious to one of ordinary skill in the art to use a laser beam as illumination because a laser light source would reduce scattering and provide a more accurate image, particularly when the imaging device has a 1 micrometer resolution in such a system as Specht and Ohtombe.

As per claim 30, Ohtombe teaches:

wherein said article to be inspected has a plurality of comparable pattern units, one of which units serves as an inspected pattern and is compared with at least one other unit of said article serving as a reference pattern. (col. 3, ll. 55-65, col. 5, ll. 15-23).

As per claim 31, Specht teaches:

wherein the article to be inspected is a semiconductor wafer having a plurality of like integrated-circuit dies each formed with like patterns, the pattern of one die serving as the inspected pattern and is compared with the like pattern of at least one other die serving as the reference pattern. Specht uses a first area detected by detector 14 to be registered with a second area detected by detector 16, col. 3, ll. 55-65.

As per claim 32, Specht teaches:

wherein the article to be inspected is a semiconductor wafer having a plurality of like integrated-circuit dies, each die being formed with a plurality of like patterns, one of which patterns of one die serves as the inspected pattern and is compared with another like pattern of the same die serving as the reference pattern. Specht uses a first area detected by detector 14 to be registered with a second area detected by detector 16, col. 3, ll. 55-65.

As per claim 49, Ohtombe teaches:

illumination means for illuminating each suspected location of the inspected article, and a corresponding location on a reference article (figure 1, element 3); Ohtombe does not specifically teach two sets of electrical signals. However, Specht teaches:

converter means for receiving the images of the illuminated areas of the inspected article and of the reference article, and for converting said images to two sets of electrical signals representing pixels of the received images of the inspected article and of the reference article, respectively (col. 3, ll. 50-55); and

comparison means for comparing the two sets of images and for outputting an electrical signal indicating a defect at a location wherein a mismatch of a predetermined magnitude occurs between the inspected article image and the reference article image (col. 3, ll. 56-60). Because these features represent a specific method of comparing the article with a reference to locate the deflects and because Ohtombe provides only a general teaching of making the comparison, it would have been obvious to one of ordinary skill that the Ohtombe comparison could have been performed using the data flows taught by Specht et al.

As per claim 53, Specht teaches:

wherein said comparison means includes a processor which compares the two sets of images pixel-by-pixel, with each pixel including its surrounding pixels (subportions), in accordance with predetermined thresholds (col. 3, ll. 61-64).

As per claim 54, Specht teaches:

wherein said comparison means outputs signals indicating the location)particular pixel location) of each defect detected. (col. 3, l. 65).

As per claim 47 and 48, these claims recite substantially the same features as claims 17 and 18 above as taught by Specht and analogous remarks apply. Because these features represent a specific method of comparing the article with a reference to locate the deflects and because Ohtombe provides only a general teaching of making the comparison, it would have been obvious to one of ordinary skill that the Ohtombe comparison could have been performed using the data flows taught by Specht et al.

As per claims 78 and 79, they recite substantially the same limitations as claims 6 and 7 that were rejected in view of Ohtombe and analogous remarks apply.

19. Claims 26-28, 64-68 and 95 are rejected under 35 U.S.C. 103(a) as being unpatentable over Specht as applied to claims 17 and 55 above, and further in view of Liudzius et al. (hereinafter Liudzius), US 4872052.

As per claim 26, Specht does not specifically teach circular arrays of light collectors. However, Liudzius teaches:

wherein said N streams of data in each flow are generated by a circular array of N light collectors. ( col. 6, ll. 36-40, figure 6 elements 74A, 74B, 74C,) It would have been obvious to one of ordinary skill in the art to utilize the circular array of imaging devices of Liudzius in the

system of Specht in order for the image processor to gather accurate shape information without distortion due to the amount of distance from the lens of the imaged object.

As per claim 27, Specht does not specifically teach using a grid of angularly spaced lines. However, Liudzius teaches:

wherein said comparable pattern units are based on a grid of angularly-spaced lines, and said circular array of light collectors include light collectors located to collect the light in regions midway between the angularly-spaced lines of the grid, thereby minimizing the amount of pattern-reflected light collected by the respective light collector. Figure 6 elements 72A-C and 74A-C).

As per claim 28, Specht does not specifically teach using a grid, However, Liudzuis teaches:

wherein said grid is constituted of eight 45° spaced lines, there being eight light collectors and eight streams of data in each of said first and second flows. Liudzius only shows three cameras, however, it would have been obvious to one of ordinary skill in the art to utilize more cameras to further improve the accuracy of the system of Specht and Liudzius by having greater number of imaging devices.

As per claim 95, Specht teaches:

wherein said N streams of data in said first stream and said second N streams of data is said second stream are generated from simulated images derived from a data base (col. 5, ll. 21-23). But Specht does not teach the circular array of light collectors, however, Liudzuis does teach such a feature in figure 6.

Claims 64-67 repeat substantially the same limitations as claims 26-28 above and analogous remarks apply.

As per claim 68, Liudzius teaches:

wherein said optic scanning means further includes a light deflector for deflecting the light beam along one orthogonal axis, and means for moving the article along another orthogonal axis to thereby effect the two-dimensional scanning of the comparable pattern units to be inspected (figure 5, col. 6, ll. 24-31).

20. Claims 69, 70, 72-77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Specht as applied to claims 17 and 55 above, and Liudzius further in view of Silverman, US 4572662.

As per claim 69, neither Specht nor Liudzius teaches the use of fiber optics. However, Silverman teaches:

wherein each of said light collectors includes an optic fibre for guiding the light to the respective light detector( figure 2, elements 119, 121,, 123, 125, col. 6, ll. 49-53). It would have been obvious to one of ordinary skill in the art to utilize the optical configuration teachings of Silverman with the defect detection system features of Specht so that object features can be more readily discerned by the system.

As per claim 70, Specht teaches:

wherein the light receiving end of each of said optic fibres is of a shaped, curved configuration having sides converging from a base substantially parallel to the inspected article, to a pointed tip overlying the inspected article.(figure 1, elements 14 and 16, Specht shows conical shaped image receiving elements).

As per claim 72, Silverman teaches:

wherein said light source is a laser (Abstract).

As per claim 73, Silverman teaches:

wherein said laser outputs a linearly polarized beam (col. 3, ll. 20-30);

and said optic scanning means further includes a polarizer between the laser and the article to be inspected which converts the linearly polarized beam to a circularly polarized (col. 4, ll. 10-15, 42-46) beam applied to the surface of the inspected article.

As per claim 74, Silverman teaches:

wherein said polarizer also converts the light reflected from the article (col. 3, ll. 20-30) to linear polarization orthogonal to the linear polarization direction of the polarized laser beam; and wherein said optic scanning means includes a further light detector for receiving the reflected light from said polarizer, and a beam splitter (col. 3, ll. 33-35)between the laser and polarizer for reflecting the reflected light to the further light detector and for blocking the reflected light from the laser.

As per claim 75, Silverman teaches:

wherein said optic scanning means further includes an acousto-optic deflector which deflects the light beam along said one orthogonal axis in a sawtooth pattern in the time domain (figure 6); and a drive for driving the inspected article along the other orthogonal axis to effect the two-dimensional scanning of the surface of the inspected article. (figure 2)

As per claim 76, Silverman teaches:

wherein said optic scanning means further includes a beam expander (col. 1, ll. 32 and 51) between the light source and the light deflector, and a cylindrical lens which focuses the expanded beam on the light deflector.

As per claim 77, Specht teaches:

wherein said optic scanning means further includes a multi-magnification telescope having a rotatable turret carrying different objectives for focussing the light beam on the article to be inspected.

21. Claim 71 is rejected under 35 U.S.C. 103(a) as being unpatentable over Specht, Liudzius, and Silverman as applied to claims 70 above, and further in view of Pryor, US 4131365.

As per claim 71, neither Specht, Liudzius, and Silverman teach the light receiving end having specific dimensions. However, Pryor shows a similarly shaped receiving element. Pryor teaches:

wherein the width of the light receiving end of each of said optic fibres is about 16° at its base and forms an angle of about 49° between its base and its tip. (figure 12, element 502). It would have been obvious to one of ordinary skill in the art to use the features taught by Pryor to augment the optical features of Specht, Liudzius, and Silverman to provide a system that is capable of continuous measurement of moving products and parts automatically without human intervention.

22. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohtombe as applied to claim 1 above.

As per claim 10, Ohtombe teaches:

wherein said first examining phase is effected by a light source which is deflected to scan a line along one orthogonal axis, while the article to be inspected is physically displaced along a second orthogonal axis.(Figure 1, elements 3 and 14, col. 2, ll. 52-54). However, Ohtombe does not specifically teach that the light is a laser beam. It would have been obvious to one of ordinary skill in the art to use a laser beam as illumination because a laser light source would reduce scattering and provide a more accurate image, particularly when the imaging device has a 1 micrometer resolution.

23. Claims 24 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Specht as applied to claims 17 and 61 above.

As per claims 24 and 62, Specht teaches:

(a) local maxima (a local minimum, col. 14, ll. 27-28), indicating whether the pixel is a maximum relative to its neighbours; A local maximum is merely the local minimum multiplied by a (-1), so the conversion to a local maximum from the local minimum would have been obvious to one of ordinary skill in the art.

(b) intensity (Specht, col. 7, ll. 30-31), indicating whether the intensity of the pixel is significant relative to a predetermined threshold;

(d) gradient (col. 3, l. 31, col. 5, ll. 59-61), indicating whether the pixel is located in a sloped area with neighbouring pixels relative to a predetermined threshold. However, Specht does not specifically teach:

(c) ratio of intensity, indicating whether the intensity of the pixel is significant with respect to its neighbours relative to its predetermined threshold; But it would have been obvious to one of ordinary skill in the art to determine a ratio between neighboring pixels particularly

when Specht already requires the determination of a local maximum. Determination of a local maximum obviously requires a comparison between values to determine if the pixel under consideration is a maximum.

24. Claims 34 and 81 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maeda as applied to claim 33 and 80 above, further in view of Liudzuis et al., (hereinafter Liudzuis ), US 4872052.

As per claims 34 and 81, Maeda does not specifically teach adjusting the table vertically. However, Liudzuis teaches vertically adjusting the imaging device which would have been obvious to one of ordinary skill in the art to either adjust the imaging components of the inspection device or inspection table (col. 9, ll. 48-57, col. 13, ll. 20-25), this is a mere design choice.

25. Claims 35 and 83 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maeda as applied to claims 33 and 80 above, further in view of Hara et al., (hereinafter Hara), US 4700225.

As per claims 35 and 83, as stated above in rejecting claim 33 and 80 above, Maeda teaches imaging different depths, but Maeda does not specifically teach flashing a lamp. However, Hara teaches:

a lamp is flashed at periodic intervals while the inspected article and reference are being moved with respect to the opto-electric converter. (ABSTRACT).

It would have been obvious to one of ordinary skill in the art to use stroboscopic lighting as taught by Hara in the high speed defect detection system of Maeda so that the movement of the semiconductor holding stage would not have to be halted while imaging (col. 1, ll. 33-36).

26. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohtombe and Specht as applied to claim11 above, and further in view of Maeda.

As per claim 12, neither Ohtombe nor Specht teaches registering the images for a plurality of depths. However, Maeda does teach such a registration, as pointed out above with respect to claim 33.

Because Ohtombe, Specht and Maeda are locating defects in semiconductor devices, and because the registration of Maeda et al. would allow for more accurate defect determination in Ohtombe and Specht, it would have been obvious to one of ordinary skill to use the depth registration of Maeda with that of Ohtombe and Specht.

27. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohtombe and Specht and Maeda as applied to claim12 above, and further in view of Liudzius.

As per claim 13, Ohtombe, Specht, nor Maeda teaches registering the images for a plurality of depths by moving the inspection pattern. However, Liudzius does teach such a movement:

Moving the inspected pattern unit and reference pattern unit towards ands away from the converter. Although Liudzius teaches moving the imaging device (col. 9, ll. 48-57, col. 13, ll. 20-25) to one of ordinary skill in the art this would be analogous to moving the patterns towards the imaging device and would merely be a design choice. It would have been obvious to one of ordinary skill in the art to combine the teachings of the references because Ohtombe, Specht and Maeda are locating defects in semiconductor devices, and because the depth adjusting of Liudzuis would allow for more accurate defect determination in Ohtombe Specht and Maeda, it

would have been obvious to one of ordinary skill to use the depth adjusting of Liudzuis with that of Ohtombe, Specht, and Maeda.

28. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohtombe and Specht and Maeda as applied to claim13 above, and further in view of.

As per claim 14, Ohtombe, Specht, Maeda nor Liudzius teaches registering the images for a plurality of depths by moving the inspection pattern and using a flashing lamp. However, Hara does teach:

a lamp flashing at periodic intervals while the inspected pattern unit and reference pattern unit are being moved vertically with respect to the converter.(Abstract, col. 1, ll. 33-36).

It would have been obvious to one of ordinary skill in the art to combine the teachings of the references because Ohtombe, Specht, Maeda and Liudzuis are locating defects in semiconductor devices, and because the stroboscopic lighting of Hara to preclude halting the table in Ohtombe, Specht, Maeda and Liudzuis, it would have been obvious to one of ordinary skill to use the stroboscopic lighting with that of Ohtombe, Specht, Maeda and Liudzuis to allow for continuous defect detection.

29. Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohtombe as applied to claim 49 above, further in view of Maeda as applied to claim 33.

As per claim per claim 51, Ohtombe does not specifically teach a depth-varying means. However, Maeda as stated above in the rejection of claim 33 does teach such a feature. (col. 4, ll. 31-40). Because both Ohtombe and Maeda are locating defects in semiconductor devices, and because the registration of Maeda would allow for more accurate defect determination in

Ohtombe, it would have been obvious to one of ordinary skill to use the registration of Maeda et al. with that of Ohtombe.

30. Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohtombe and Maeda as applied to claim 50 above, further in view of Liudzuis et al., (hereinafter Liudzuis ), US 4872052.

As per claim 51, Ohtombe or Maeda do not specifically teach adjusting the table vertically. However, Liudzuis teaches vertically adjusting the imaging device which would have been obvious to one of ordinary skill in the art to either adjust the imaging components of the inspection device or inspection table (col. 9, ll. 48-57, col. 13, ll. 20-25). Since all three inventions are directed towards locating defects, it would have been obvious to one of ordinary skill in the art to merely use a convenient design choice for a multitude of factors.

31. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohtombe as applied to claim 49 above, further in view of Hara et al., (hereinafter Hara ), US 4700225.

As per claim 52, as stated above in rejecting claim 49 above, Ohtombe teaches an illuminating means, but Ohtombe does not specifically teach flashing a lamp. However, Hara teaches:

a lamp is flashed at periodic intervals while the inspected article and reference are being moved with respect to the opto-electric converter. (ABSTRACT).

It would have been obvious to one of ordinary skill in the art to use stroboscopic lighting as taught by Hara in the high speed defect detection system of Ohtombe so that the movement of the semiconductor holding stage would not have to be halted while imaging (col. 1, ll. 33-36).

32. Claims 90 and 91 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohtombe as applied to claims 2 and 42 above, and further in view of Sandland et al., (hereinafter Sandland), US 4618938.

As per claims 90 and 91, Ohtombe does not specifically teach darkfield imaging. However, Sandland teaches:

suspected locations are imaged on said converter by darkfield imaging means (col. 19, ll. 31-33, 38-40, 50-51).

It would have been obvious to one of ordinary skill in the art to utilize the teachings of Sandland's darkfield image processing features with Ohtombe's defect detection system so that an image with an acceptable signal to noise ratio can be obtained (Sandland, col. 19, ll. 25-30).

### *Conclusion*

33. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Michael US 5548326 teaches that local minima and maxima are related by multiplying by a (-1) (col. 3, ll. 1-5). Cochran et al., US 5051825, teaches a dual image video inspection system utilizing pulsed light. Turcheck, Jr. et al., US 5103304, teaches a Charged coupled device imaging system for detailed inspection. Manns et al., US 4979223, teaches the scanning laser beam output from the chirp deflector has been focused in the X direction by chirp deflector 102, and is then focused in the orthogonal, i.e., Y, direction by cylindrical lens 116. Mount, II, US 4899219, which teaches micro and macro views that allows for depth analysis.

34. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin Miller whose telephone number is (703) 306-9134. The examiner can normally be reached on Monday-Friday, 9-5. If attempts to reach the examiner by

telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9314 for regular communications and (703) 872-9314 for After Final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

mem
March 19, 2002

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